1855, 37°·2.   All the stations on the west coast are situated in higher
latitudes, yet their mean temperature was in excess of that of Oxford
in December 1857 by 2°·1 ; in the colder Decembers of 1856 and
1855, by 0°·5 and 1°·4 respectively.   During the warmest month, the
mean of all the coast stations exceeded the temperature of Oxford by
2°·0 ;   and during the other two Decembers by 1°·3 and 1°·6
respectively.

I propose to make more complete calculations, which will embrace
the other months belonging to the winter ; and by comparing the
results during different years, it is probable that corresponding infer-
ences will be suggested regarding the variations of mean temperature
which are incapable of explanation by changes of solar radiation alone.

I was induced to select December at first, because the amount of
sunshine received in our hemisphere being least during that month,
it was natural to expect that the comparative effects of the other
thermal influences would be most distinctly manifested.

Having been for some time occupied in studying the distribution
of heat over islands, I have been led to the general proposition, that
the isothermals may be represented by curves having some relation
to the coast-line, and that the positions of the centres of these curves
depend upon the relation between solar influence and oceanic tempe-
rature.   At seasons when the latter becomes important, compared to
the former, the isothermals tend to assume re-entrant shapes similar
to the mean annual isothermals of Ireland.   When the isothermals
of a mild winter month, like December of 1857, shall be laid down,
I anticipate that they will distinctly exhibit the increased thermal
influence of the ocean by presenting such an appearance.

<div align="right">HENRY HENNESSY.</div>

Major-General Sabine, V.P.R.S.

XVII. " On the Influence of Temperature on the Refraction of
Light."   By Dr. J. H. GLADSTONE, F.R.S., and the Rev.
T. P. DALE, M.A., F.R.A.S.   Communicated by Dr. GLAD-
STONE.   Received June 17, 1858.

<div align="center">(Abstract.)</div>

Those who have occupied themselves with the determination of
refractive indices, must have noticed that changes of temperature

influence the amount of refraction; yet few of the observations on record have affixed to them the temperature at which they were made, and few, if any, numerical researches have been published on the subject. To determine, if possible, the amount and character of this effect of heat was the object of the present inquiry.

The instrument employed was that described by the Rev. Baden Powell in the British Association Report for 1839, and was kindly lent by him for the purpose. The substances more or less fully examined, were bisulphide of carbon, water, ether, methylic, vinic, amylic, and caprylic alcohols, the two principal constituents of creasote—hydrate of phenyle and hydrate of cresyle, phosphorus, oil cassia, and camphor dissolved in alcohol.

Of the tabulated results the following two will suffice to illustrate the main conclusions :—

Bisulphide of Carbon.

Tempe-rature.	Refractive Index of A.	Refractive Index of D.	Refractive Index of H.	Difference per 5° C. for D.	Length of spectrum.	Dispersive power.
0° C.	1·6217	1·6442	1·7175	·0045	·0958	·01487
5	1·6180	1·6397	1·7119	·0051	·0939	·01468
10	1·6144	1·6346	1·7081	·0043	·0937	·01477
15	1·6114	1·6303	1·7035	·0042	·0921	·01462
20	1·6076	1·6261	1·6993	·0041	·0917	·01463
25	1·6036	1·6220	1·6942	·0040	·0906	·01460
30	1·5995	1·6180	1·6896	·0040	·0901	·01457
35	1·5956	1·6140	1·6850	·0037	·0894	·01456
40	1·5919	1·6103	1·6810	·0050	·0891	·01460
42	1·5900	1·6083	1·6778		·0878	·01443

Water.

Tempe-rature.	Refractive Index of A.	Refractive Index of D.	Refractive Index of H.	Difference per 5° C. for D.	Length of spectrum.	Dispersive power.
0° C.	1·3293	1·3330	1·3438	·0001	·0143	·00429
5	1·3291	1·3329	1·3436	·0002	·0145	
10	1·3288	1·3327	1·3434	·0003	·0146	·00439
15	1·3284	1·3324	1·3431	·0004	·0147	
20	1·3279	1·3320	1·3427	·0003	·0148	·00446
25	1·3275	1·3317	1·3420	·0006	·0145	
30	1·3270	1·3309	1·3415	·0006	·0145	·00438
35	1·3264	1·3303	1·3410	·0009	·0146	
40	1·3257	1·3297	1 3405	·0008	·0148	·00449
45	1·3250	1 3288	1·3396	·0009	·0146	
50	1·3241	1·3280	1·3388	·0012	·0147	·00448
55	1·3235	1·3271	1·3380	·0010	·0145	
60	1·3223 ?	1·3259	1·3367		·0144	·00442
65	1·3218	1·3249		·0012	·0138	
70	1·3203	1·3237	1·3344	·0012 (A)	·0141	·00435
80	1·3178	....	1·3321		·0143	

The following are the conclusions arrived at :—

1. In every substance the refractive index diminishes as the temperature increases. This is seen in the first four columns of the tabulated results, which represent the refractive indices of the fixed lines of the spectrum A, D, and H respectively at the temperatures indicated, while the succeeding column shows the amount of difference for each five degrees Centigrade. This change of refractive index by heat, for which the term *sensitiveness* is proposed, varies greatly in amount in different substances, melted phosphorus and bisulphide of carbon being the most, and water the least sensitive of the liquids examined.

2. The length of the spectrum varies as the temperature increases. The difference between the refractive indices of the lines A and H, or $\mu_{_H} - \mu_{_A}$, is taken as the measurable length of the spectrum, and is given in the sixth column. In the case of highly dispersive substances, as bisulphide of carbon and hydrate of phenyle, it decreases considerably ; in the case of less dispersive bodies, as the alcohols, it decreases to a less extent; while with water the change is not appreciable.

3. In some substances the dispersive power is diminished, in others it is augmented by a rise of temperature ; that is, in such substances as bisulphide of carbon, it is the numerator of the fraction $\frac{\mu_{_H} - \mu_{_A}}{\mu_{_D} - 1}$ that decreases fastest, while in such substances as water it is the denominator. The result of this is shown in the last column.

4. The sensitiveness of a substance is independent of its specific refractive or dispersive power. Thus water and ether are very similar as to the actual amount of the refraction and dispersion exhibited by them, but ether is many times more sensitive to heat than water is.

5. The amount of sensitiveness is not directly proportional to the change of density produced by alterations of temperature ; yet there is some relationship between the two phenomena. Thus in water the index of refraction and the density both change much more rapidly at high than at low temperatures ; again, the remarkable reversion of the increase of density that takes place at 4° C. is not without its indication in the amount of sensitiveness ; and the large decrease of density at the freezing of water is accompanied by a similar decrease of refraction.

Substance.	Mean refraction ($\mu_{\mathrm{D}}-1$).	Specific gravity.	Ratio.
Ice	0·3089	0·9184	2973
Water at 0° C.	0·3330	0·9993	3001

Moreover, as a general rule, those substances that are most affected in density by heat are the most sensitive.

6. No sudden change of sensitiveness occurs near the boiling-point; at least this is true in respect to bisulphide of carbon, ether, and methylic alcohol.

XVIII. "On the Adaptation of the Human Eye to varying Distances." By CHARLES ARCHER, Esq., Surgeon, Bengal Army. Communicated by Prof. STOKES, Sec. R.S. Received June 17, 1858.

(Abstract.)

The following is a summary of the author's views on the question :—

1. The eye is adapted to varying distances principally by an alteration in the fibrous arrangement of the lens itself. Moreover, that when the lens is removed after an operation for cataract, the power of adaptation is nearly lost, and can only be exerted within very confined distances.

2. That the purpose of focalizing light at short distances is doubtless assisted, as suggested by Bowman, by the contractions of the ciliary muscle, in its antero-posterior direction, bringing forward the ciliary processes.

3. That as the posterior hemisphere of the capsule is firmly united to the hyaloid membrane, this portion must always remain quiescent, and therefore the antero-posterior contractions of the ciliary muscle must be very limited as regards the lens.

4. That the ciliary muscle, being placed around the eye, and its fibres being of a somewhat plexiform character, the contractions of the muscle will relax those yielding portions of the eye placed within its circumference.

5. That the relaxations of the ciliary processes will deprive the capsule of its firm support. It will be pressed forward by the lens,